

# FAA's Airport Pavement Test Vehicle – Need, Capability, and Future Research

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Technology Transfer Conference

By: Navneet Garg, Ph.D.

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Federal Aviation  
Administration





# Future

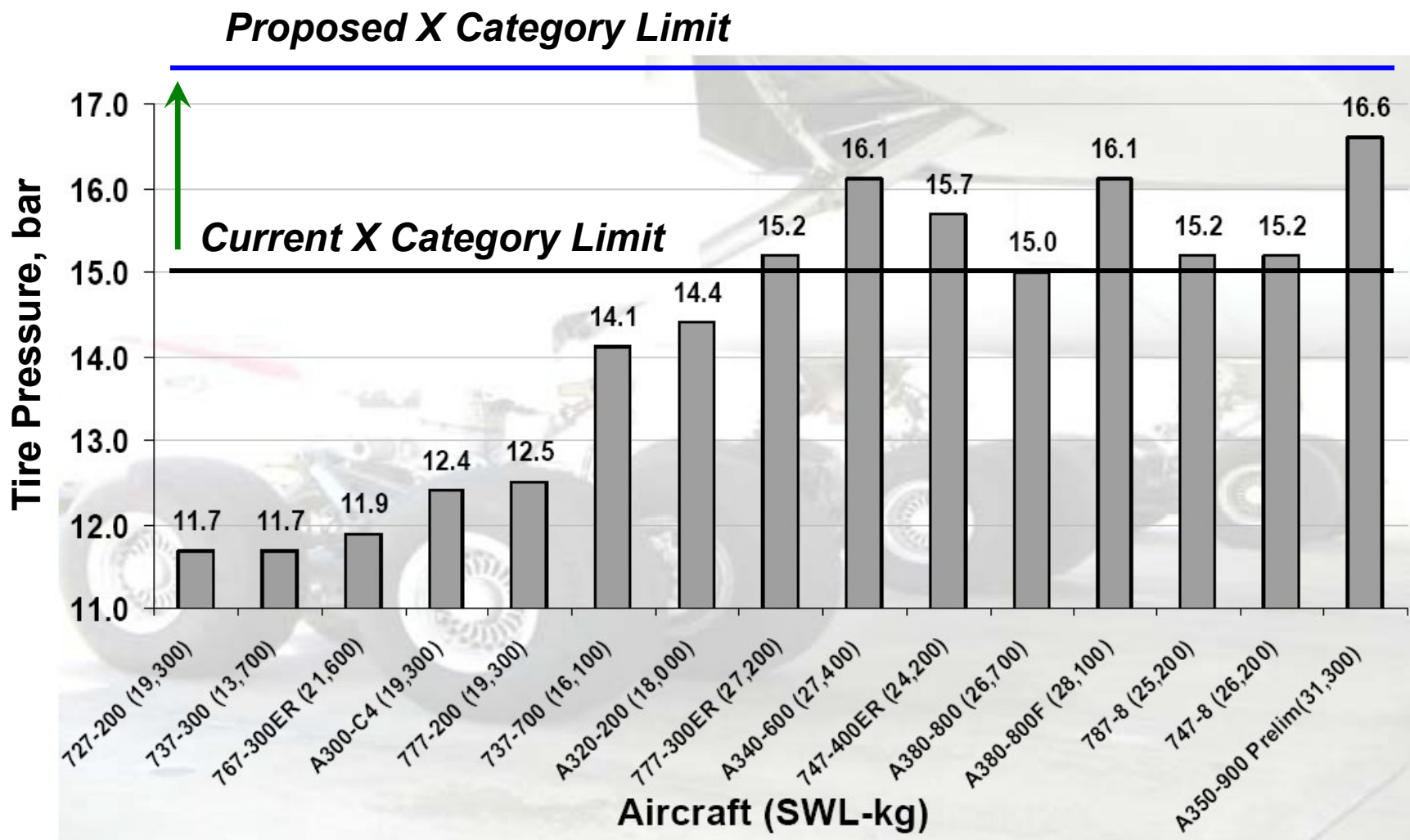


# Aircraft Tire Pressure Trends

- The trend in aircraft industry is to produce aircraft with extended range capability - results in high gross weight and tire pressures.
- ICAO 'X' category limit was 217-psi.
- Boeing 787 and Airbus 350 will have tire pressures close to 250 psi.



# Aircraft Tire Pressure Trends



# Changes to ICAO Tire Pressure Categories

Tire Pressure Category	Previous ICAO Limits psi (MPa), loaded	New ICAO Limits psi (MPa), loaded
W	Unlimited	Unlimited
X	217 (1.50)	254 (1.75)
Y	145 (1.0)	181 (1.25)
Z	72 (.50)	72 (.50)



# **NEED FOR APTV/HTPTF**

- To develop new specifications for P-401 (based on gyratory compactor) and other HMA related projects, R&D has relied mostly on laboratory testing. Full-scale tests are needed so that the performance prediction models for HMA from laboratory tests can be validated/calibrated to the in-situ pavements.
- NAPTF – ideal for testing pavement structure as a whole, not for surface layers.

**APTV/HTPTF WILL PROVIDE THAT CAPABILITY.**



# APTV/HVS-A



FAA's Airport Pavement Test Vehicle  
August 13, 2014



Federal Aviation  
Administration

# AIRPORT PAVEMENT TEST VEHICLE

- **Heavy Vehicle Simulator – Airport Version (HVS-A)**
  - Wheel loads - up to 100,000 lbs.
  - Pavement temperatures up to 150°F
  - Test speeds - 0.17 to 5 mph
  - Single and Dual-Wheel configuration.
  - Single wheel will be radial aircraft tires size 52x21.0R22
  - Dual wheel assembly is designed to accommodate smaller tires (B-737-800)
  - Wander Width – 6 feet
  - FAA Acceptance – November 1, 2013



# HVS-A Test Pavement

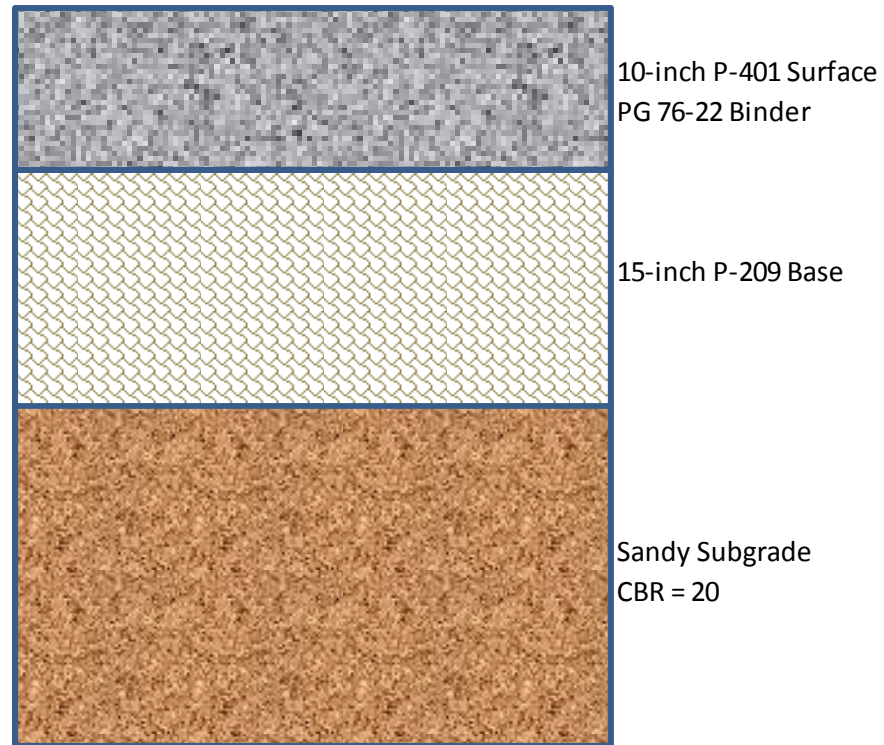
Location in  
207 Yard



# HVS-A Acceptance Test Strips

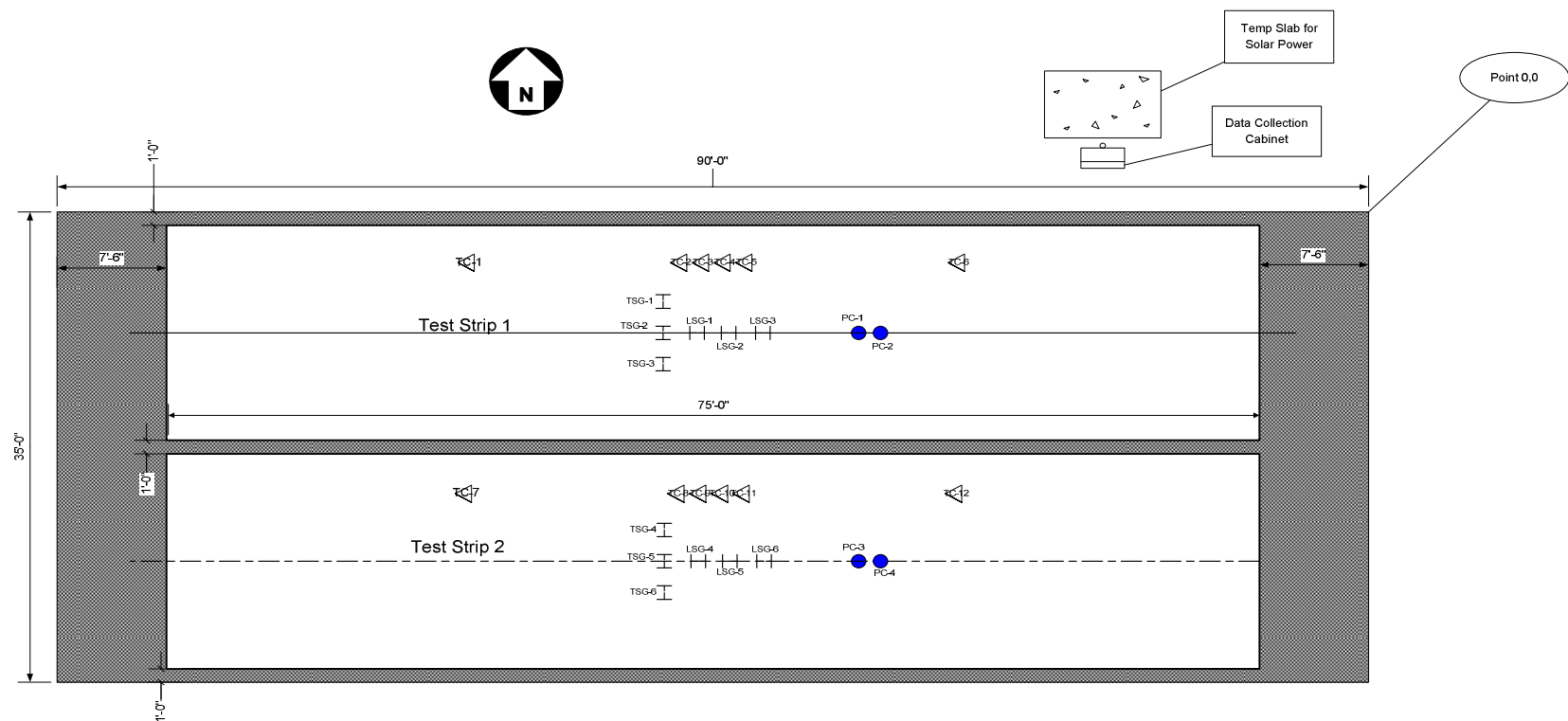


# HVS-A Acceptance Test Strips



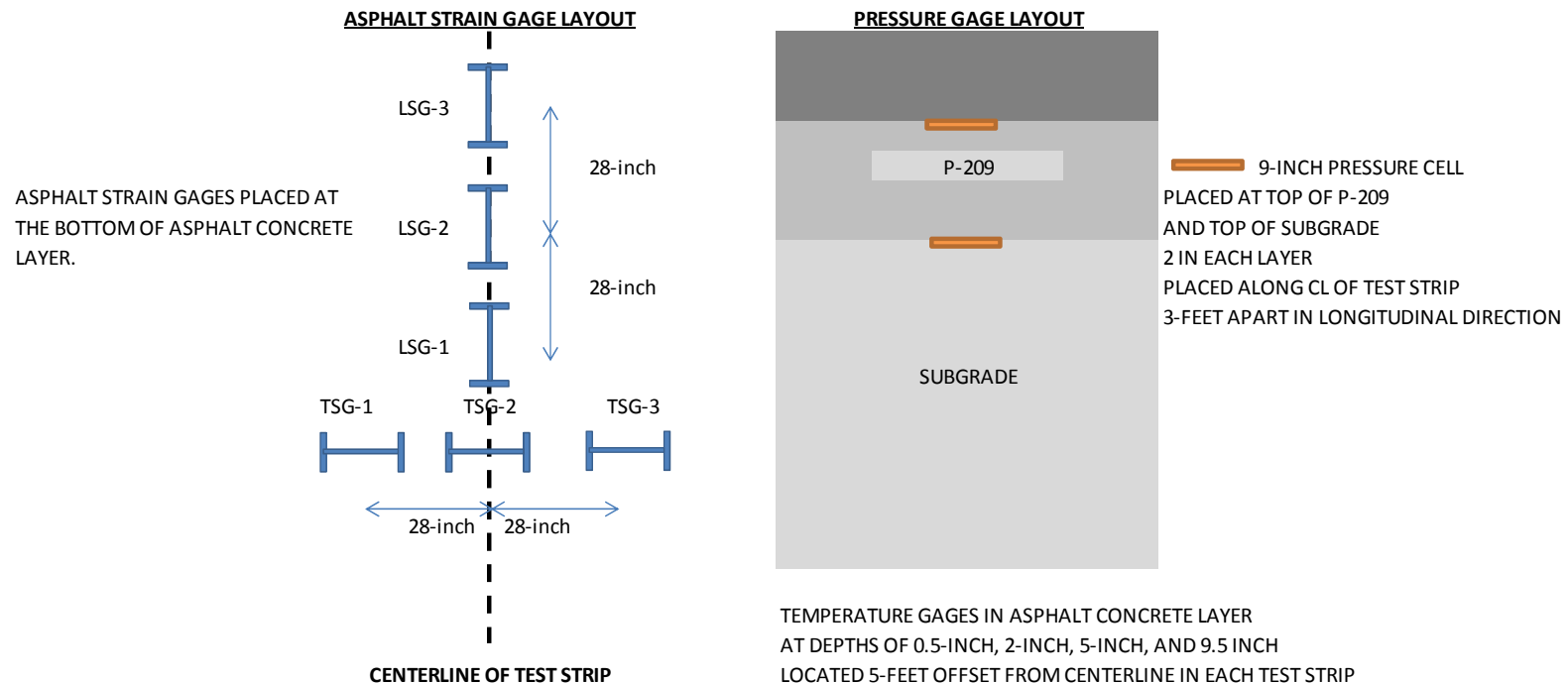
PAVEMENT CROSS-SECTION

# HVS-A Acceptance Test Strips



# HVS-A TS: Response and Traffic Tests

## INSTRUMENTATION LAYOUT FOR HVS-A SITE ACCEPTANCE TEST STRIPS



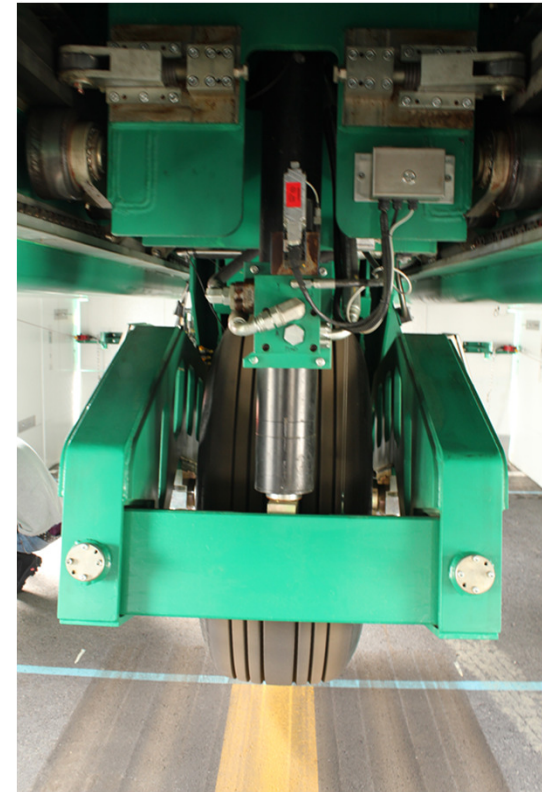
# HVS-A ACCEPTANCE TEST STRIPS

## ***Objectives:***

- Study the effects of Tire Pressure on performance of HMA layer.

## ***Tests:***

- Response Tests.
- Traffic Tests.



# HVS-A TS: RESPONSE TESTS

- Tire pressure: 210-psi Test Strip-1  
245-psi Test Strip-2
- Pavement Temperature: 140 deg. F measured at a depth of 1-inch below pavement surface.
- Test Speed: 2-mph
- Wheel loads: 30,000-lbs, 40,000-lbs, 50,000-lbs.



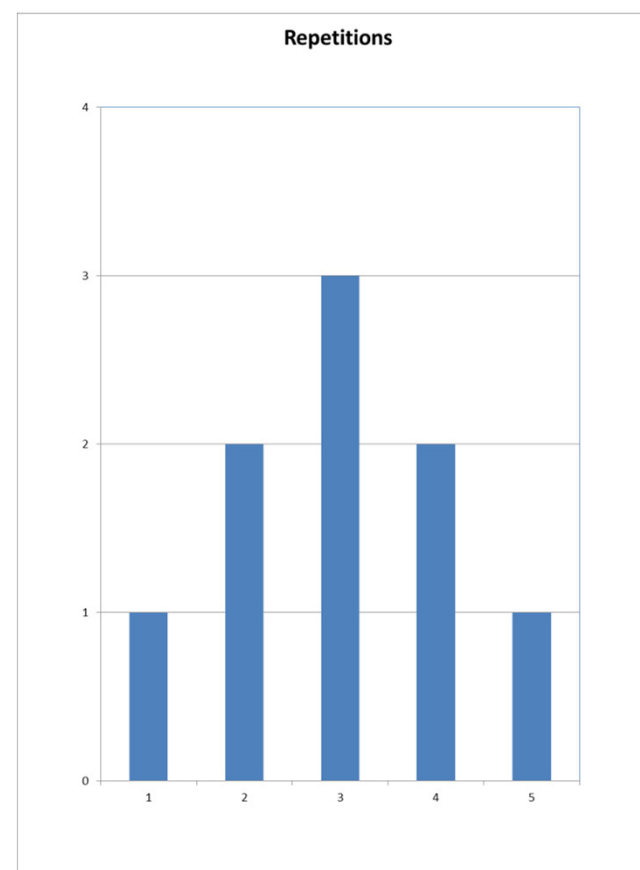
# HVS-A TS: TRAFFIC TESTS

- Tire pressure: 210-psi Test Strip-1  
245-psi Test Strip-2
- Pavement Temperature: 140 deg. F measured at a depth of 1-inch below pavement surface.
- Test Speed: 2-mph
- Wheel loads: 61,300-lbs.

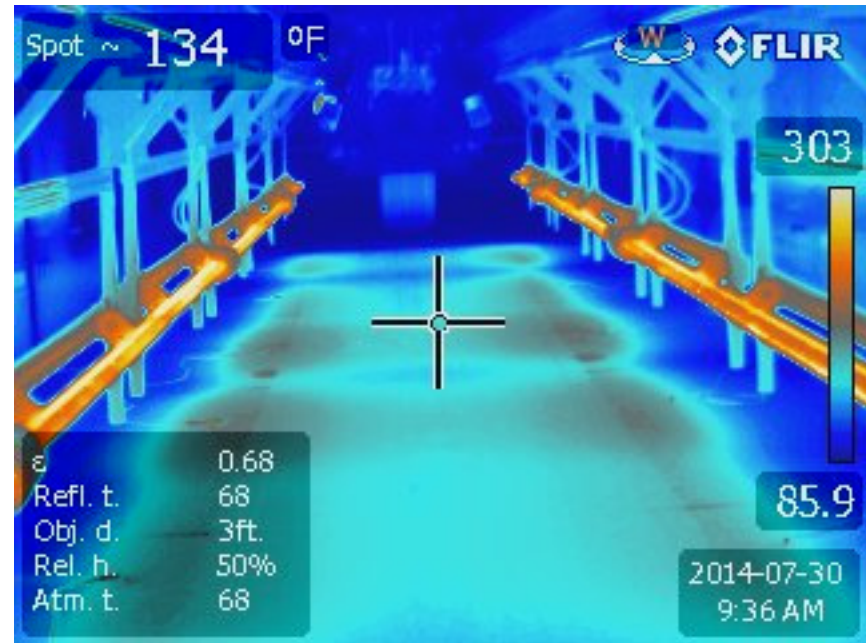


# HVS-A TS: Wander Pattern

Sequence No.	Track No.	Transverse Wander Position, in
1	-2	16
2	-2	16
3	0	36
4	0	36
5	2	56
6	2	56
7	1	46
8	1	46
9	-1	26
10	-1	26
11	0	36
12	0	36
13	1	46
14	1	46
15	-1	26
16	-1	26
17	0	36
18	0	36



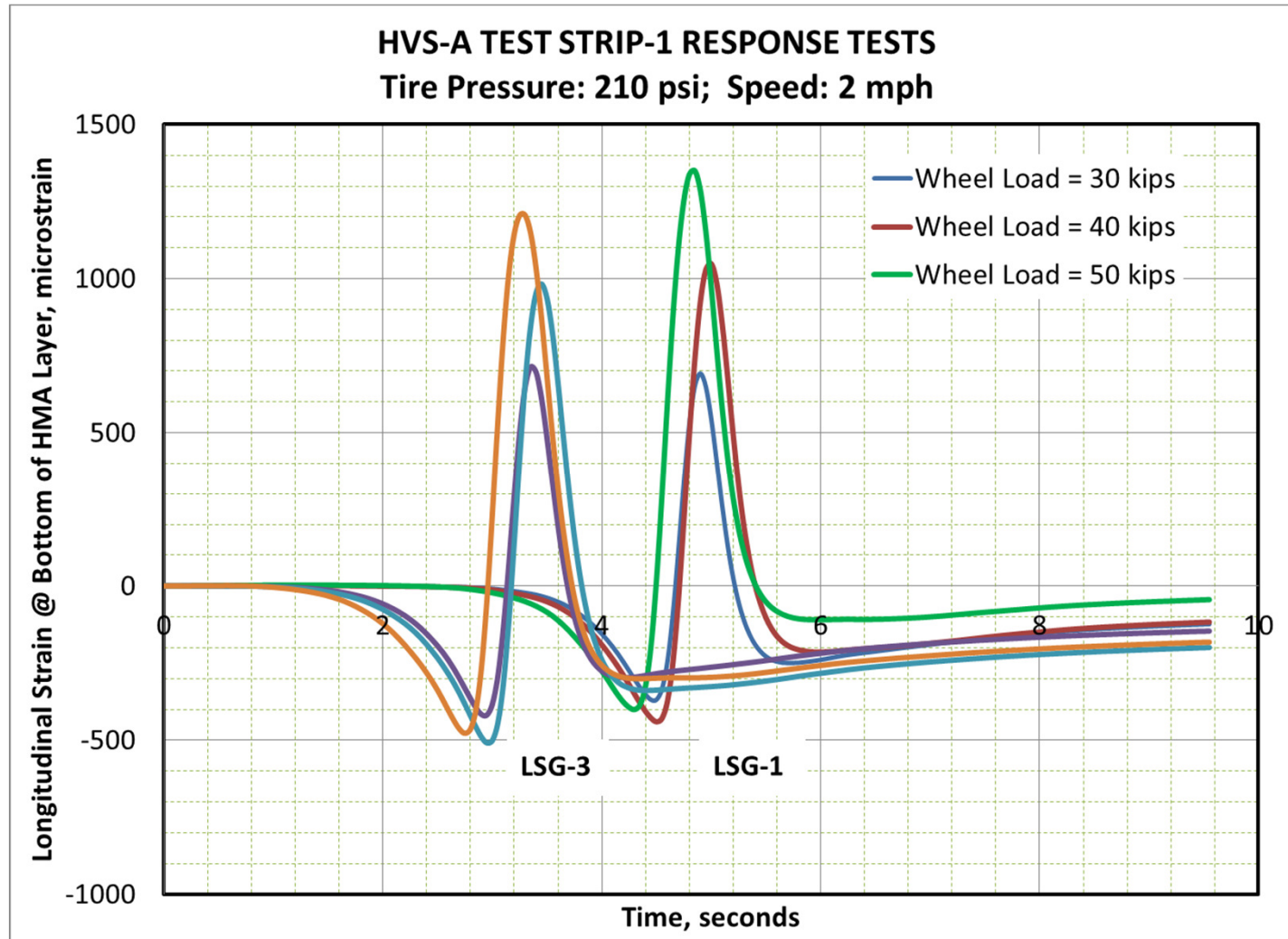
# HVS-A TS: Response and Traffic Tests



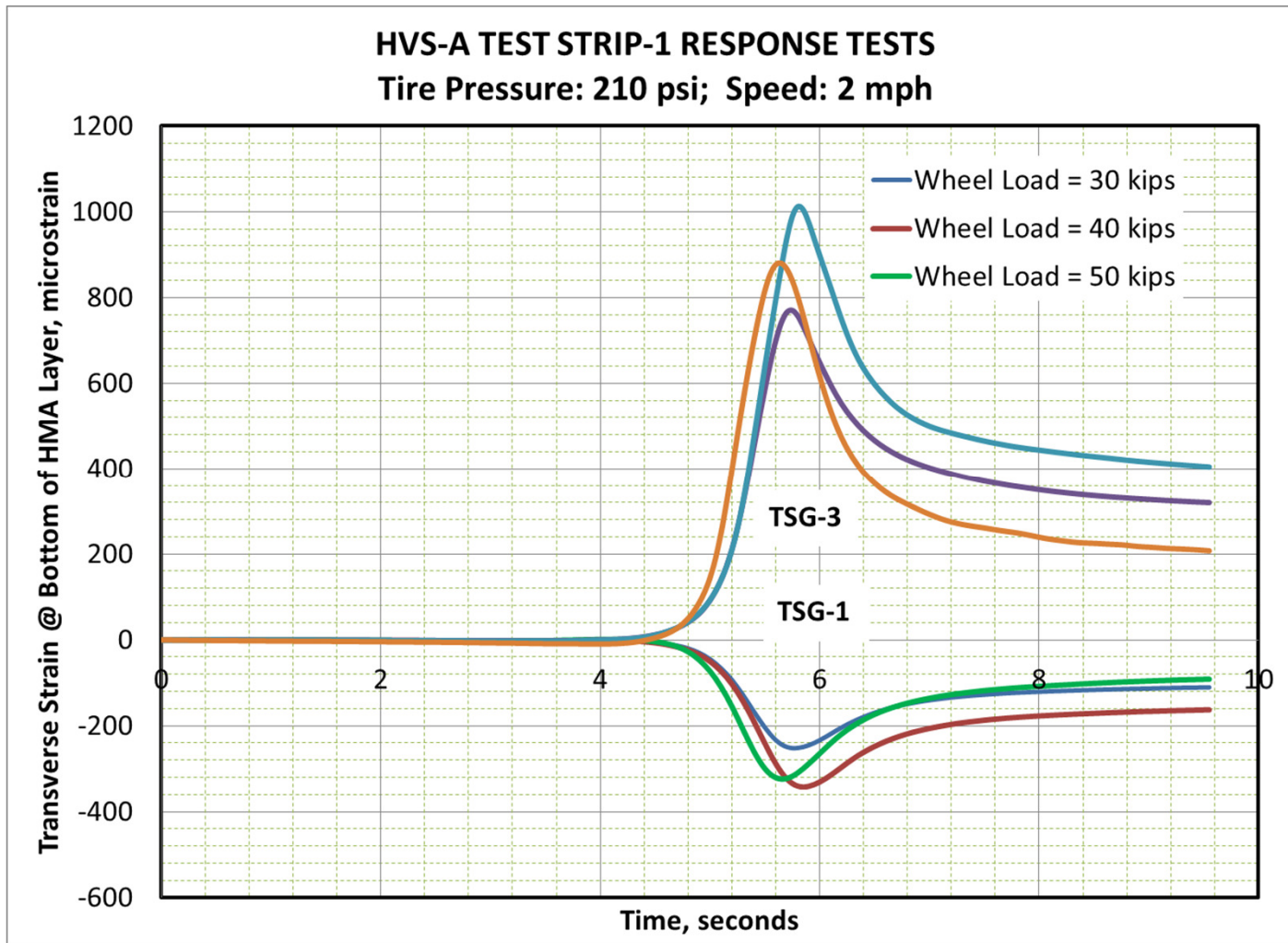
# HVS-A TS: Response and Traffic Tests



# HVS-A TS: Response Tests



# HVS-A TS: Response Tests



# HTPTF-Construction Cycle 1

## ***Objectives:***

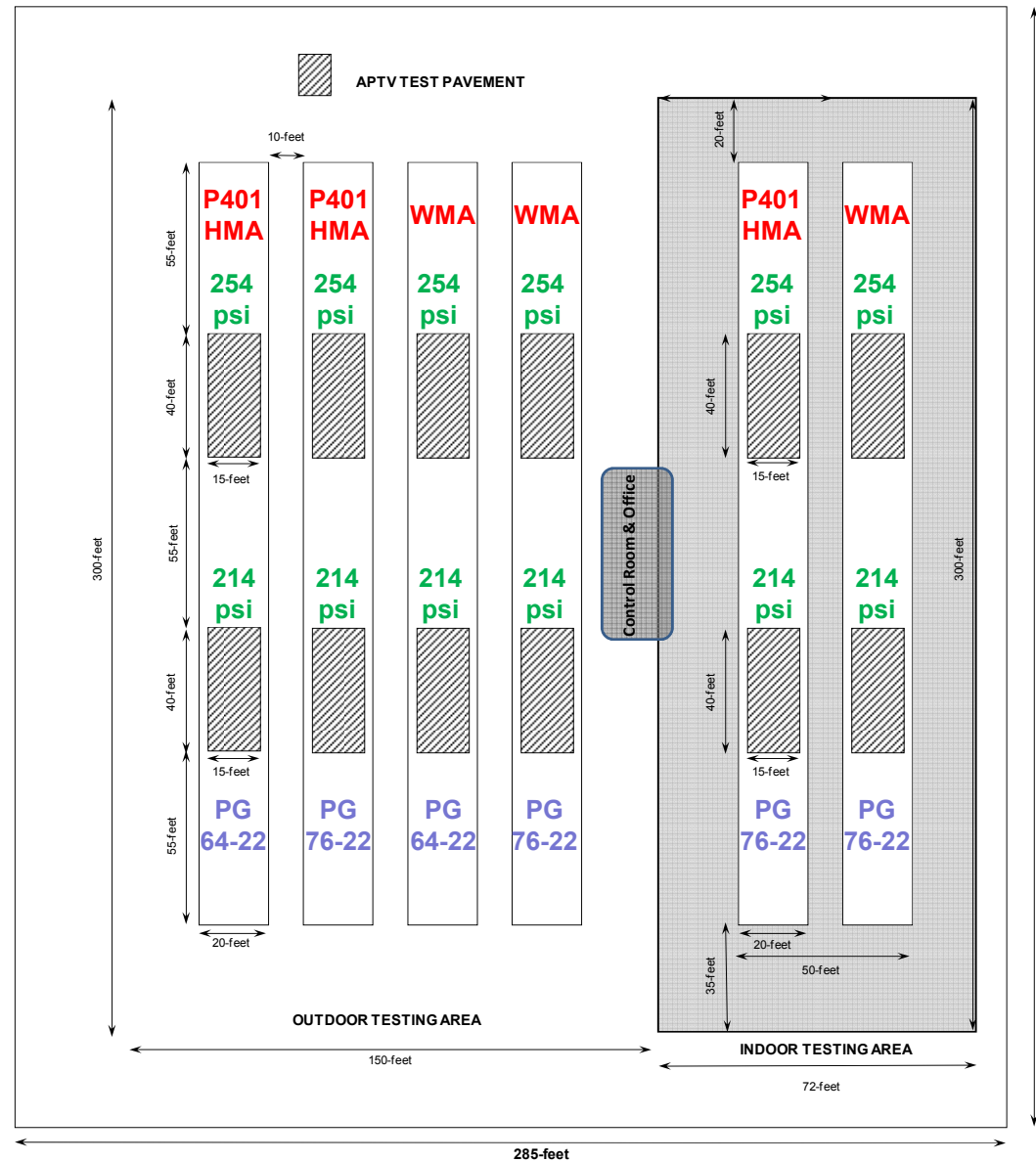
- Study the effects of Tire Pressure on performance of HMA layer.
- Study the effect of polymer modified binder on HMA layer performance.
- Evaluate the performance of Warm Mix Asphalt under aircraft wheel load.



**MATERIAL**

**TIRE  
PRESSURE**

**BINDER  
TYPE**



TOTAL AREA = 102,600 sq. feet (2.36 acres)

# HTPTF Cross Sections

HTPTF TestStrip Des. Life = 20		
Layer Material	Thickness (in)	Modulus or R (psi)
P-401 / P-403 HMA Surface	5.00	200,000
P-209 CrAg	12.00	59,228
Non-Standard Structure		
P-154 UnCrAg	12.00	24,700
Subgrade	CBR = 15.0	22,500
HMA CDF = 0.05; Sub CDF = 0.97; Str Life (SG) = 20.7 yrs; t = 29.00 in		

# Future Research

- “Green” technologies such as Warm Mix Asphalt
- Stone Matrix Asphalt
- Recycled Asphalt Pavement
- Polymer Modified Binders
- Shear failure of HMA
- Performance of HMA overlays on
  - Flexible Pavements
  - Rigid Pavements

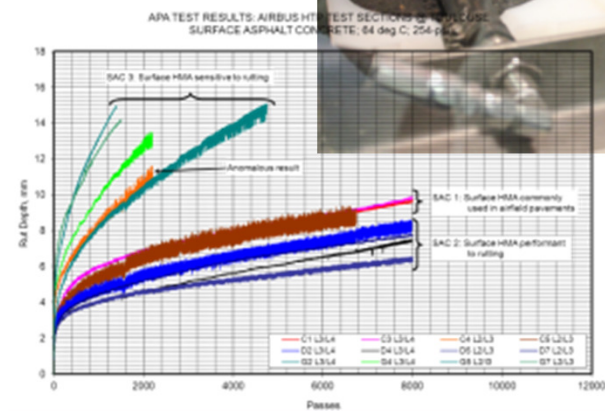
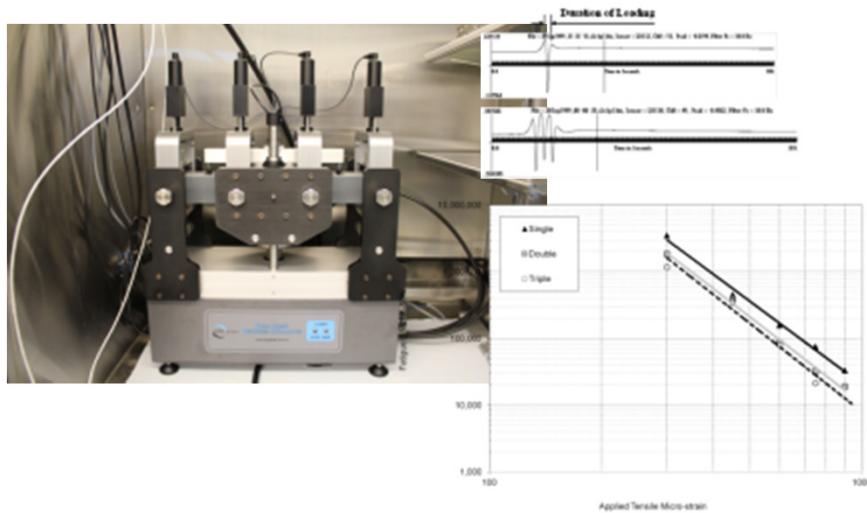
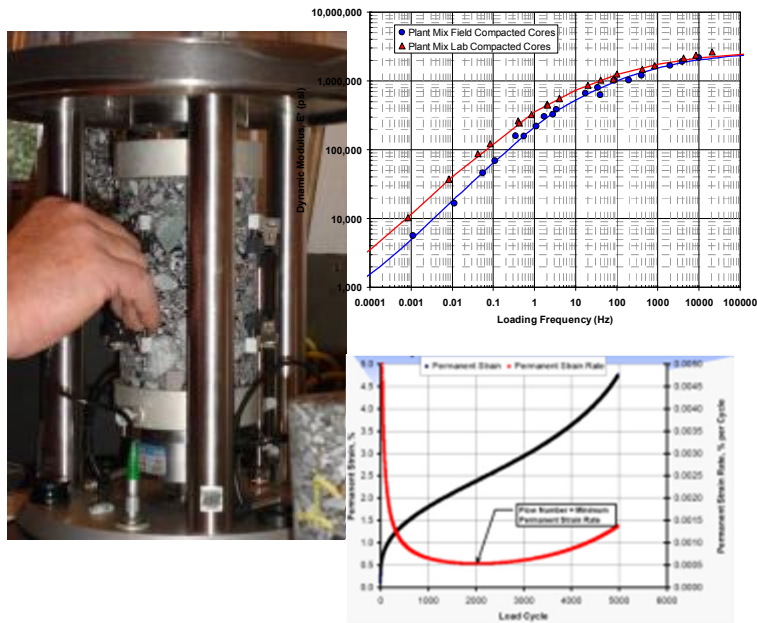


# Future Research

## Use of Additives and Nanoparticles to Improve Performance of Airport Pavement Materials

- Evaluate the use of Additives and Nanoparticles for Improved Performance of Airport Pavement Materials
- Develop Standards/Specifications and Guidelines for Pavement Materials that have been modified with Nanoparticles and other Additives.







## FULL SCALE APT

